The Use of a Technical Library

By

W. E. JORGENSEN

Circular Series, No. 6

June 1942

Engineering Experiment Station
Oregon State System of Higher Education
Oregon State College

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Oregon State College Library

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PREFATORY NOTE

Publication of this paper by the Engineering Experiment Station is appropriate because the library is a most important facility for the research worker and student in either science or technology. It is through the correct understanding of basic principles applying to a given problem and a knowledge of what has been done on it by others that hopeless effort or waste of time in useless repetition of work may be avoided.

A research project is born in the mind of the inventive scientist or engineer. Logically the first step by the systematic worker, after conception of the idea, is to check it for fundamental soundness and originality. For this the facilities of a good library are indispensable.

Unfortunately the fascination of direct attack, perhaps by laboratory experimentation, is so great that proper library research is often neglected. Often too, the experimenter is quite unfamiliar with the technique of library research and with the services a good library can render him.

The discussion in this circular covering the organization of the Oregon State College Library, prepared by Mr. W. E. Jorgensen, Engineering Librarian, should serve to some extent as a manual of library technique for the research worker and the engineering student as well. It applies particularly to the facilities and services available in the Engineering and Technology Reference Room.

By S. H. GRAF, Director of
Engineering Research

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By

W. E. JORGENSEN, Engineering Librarian,
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I. INTRODUCTION

With the great increase in the production of printed materials has come a corresponding growth in the size and number of libraries. As libraries increase in size, their organization and facilities tend to become more complex, all of which causes confusion and difficulty for the library patrons. Large libraries have attempted to alleviate these difficulties which are inherent in a complex organization, by segregating portions of their collections that are used largely by special classes of patrons—such as those working in science, engineering, law, medicine, history, education, art, music, business, agriculture, or forestry. This program allows the specialist easier access to the collection in his field as well as more direct service from the library staff.

In addition to adapting the organization of the library to suit the needs of its patrons, many libraries provide manuals or guides to assist the patron in making use of all the facilities and services offered. These general manuals, however, are not especially pertinent for those specialists who are confining their bibliographic activities to one division of the library. A manual for a special collection such as a technical library should assist the specialist in that field in locating library materals with maximum efficiency.

This brief discussion on the use of a technical library is intended as a guide for those interested in the literature of engineering and technology. The manual is written especially for the Engineering and Technology Reference Room of the Oregon State College Library, although the information may be applied equally well to the use of other collections of the same type.

The author wishes to express appreciation to those whose assistance and criticism made this manual possible. Special acknowledgment is due to Miss Lucy M. Lewis, Director of Libraries, for her helpful suggestions, to Professors G. W. Gleeson, F. O. McMillan, F. Merryfield, and G. B. Cox of the School of Engineering for their cooperation in the study of the literature, and to S. H. Graf, Director of Engineering Research, for guidance on the literature of Mechanical Engineering and for assistance in preparing the manuscript for publication.

II. THE USE OF A TECHNICAL LIBRARY

Illustrated by a survey of the resources and services of the Engineering and Technology Reference Room in the Oregon State College Library.

The proper use of a technical library presupposes a knowledge of its facilities, familiarity with library research procedures, and an appreciation for the scope of the literature in each subject field. These factors may be acquired through the study of a typical collection, such as the Engineering and Technology Reference Room of the Oregon State College Library.

III. THE ORGANIZATION OF THE OREGON STATE COLLEGE LIBRARY

1. **Purpose of the library.** The library is organized for the purpose of assisting in the educational program of the College by making printed material available for student and faculty use in study and research, by guidance in the use of library materials, and by imparting to the student an appreciation for the scope and value of literature in general. It operates to serve the best interests of the whole College program of instruction and research.

The library maintains a staff of professionally trained librarians as well as clerical and student assistants to carry out the many procedures necessary in making printed materials available to its patrons. A considerable amount of "bookkeeping" is needed to keep account of the 188,000 volumes now (April, 1942) shelved in the Library. Complex methods are needed to deal with complex materials. All material in the Library must be so cataloged and shelved that it can easily be found at all times.

2. **Functional divisions of the library.** To accomplish the above ends, the work in libraries is divided into the functional groups as follows: (1) *Order Department:* Orders and pays for all library materials and equipment. (2) *Catalog Department:* Classifies and catalogs material, which involves making records on cards to be placed in the public catalog to indicate author, title, and subjects represented in each piece of printed material. The Catalog Department also maintains a subject list on cards of all the books purchased by the institution and cataloged, whether they are shelved in the Library or in the teaching departments on the campus. The cards in this list are arranged in the same order as the books stand on the shelves, so that they fall in order by classes or subjects. The list, therefore, is called a "shelf list." A shelf list may be converted into a "classed catalog" by the insertion of guide cards to indicate the several groups of classes represented. (The Engineering Room maintains a classed catalog of all the cataloged material both in that collection and in the campus department.) (3) *Reference Department:* Interprets the library to the public by assisting patrons in the use of the public catalog to find material on a given subject, compiles lists of books on certain topics, and answers questions on the use of the library as well as on related matters. (4) *Circulation Department:* Lends (circulates) and shelves the material of the library collection. Here records are kept of all books charged out to patrons. This department aranges the borrowing of books from other libraries for the use of faculty and advanced students.

In addition to these traditional functional groups, the Oregon State College Library, in accordance with a more modern program, has established reference rooms for two fields: science and technology. (See Figures 1 and 2.) All reference and circulation work in these subjects is handled by these divisions in cooperation with the main functional departments.

IV. THE ENGINEERING AND TECHNOLOGY REFERENCE ROOM AS A PART OF THE MAIN LIBRARY

The above discussion is merely a very general statement of the organization of a library to provide a background for understanding the use of a technical library, such as that in the Oregon State College Library. This technical

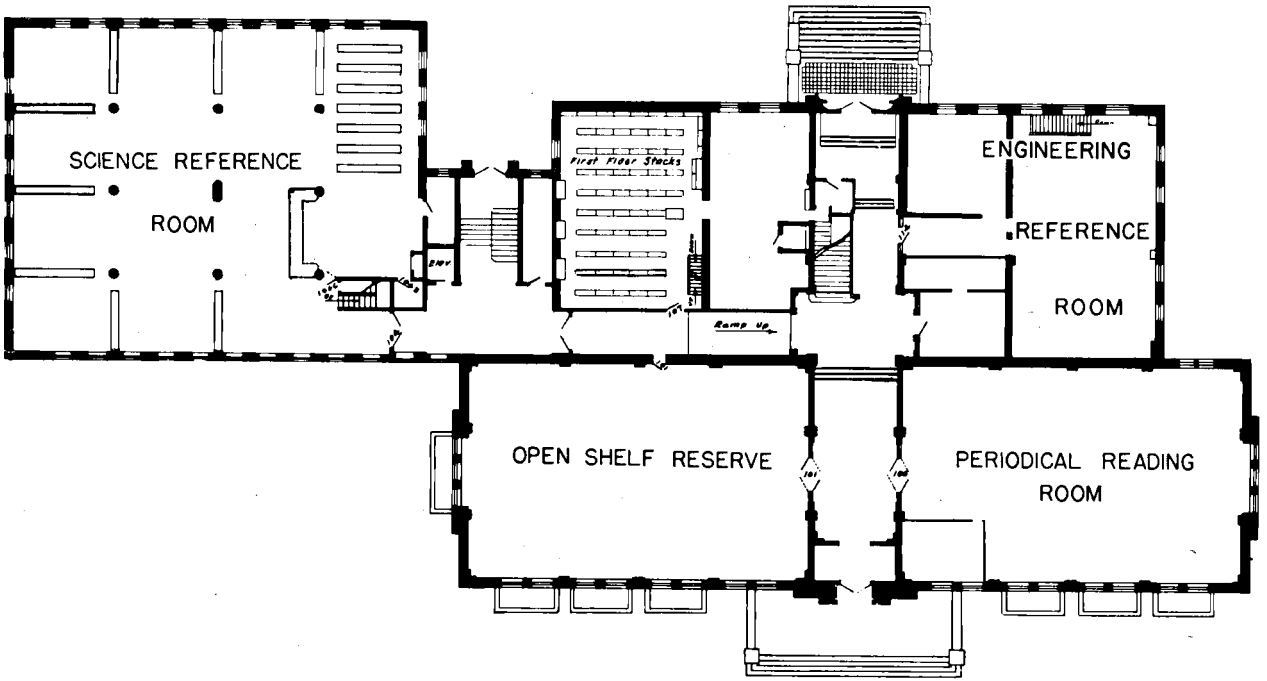

Figure 1. First Floor Plan of Oregon State College Library.

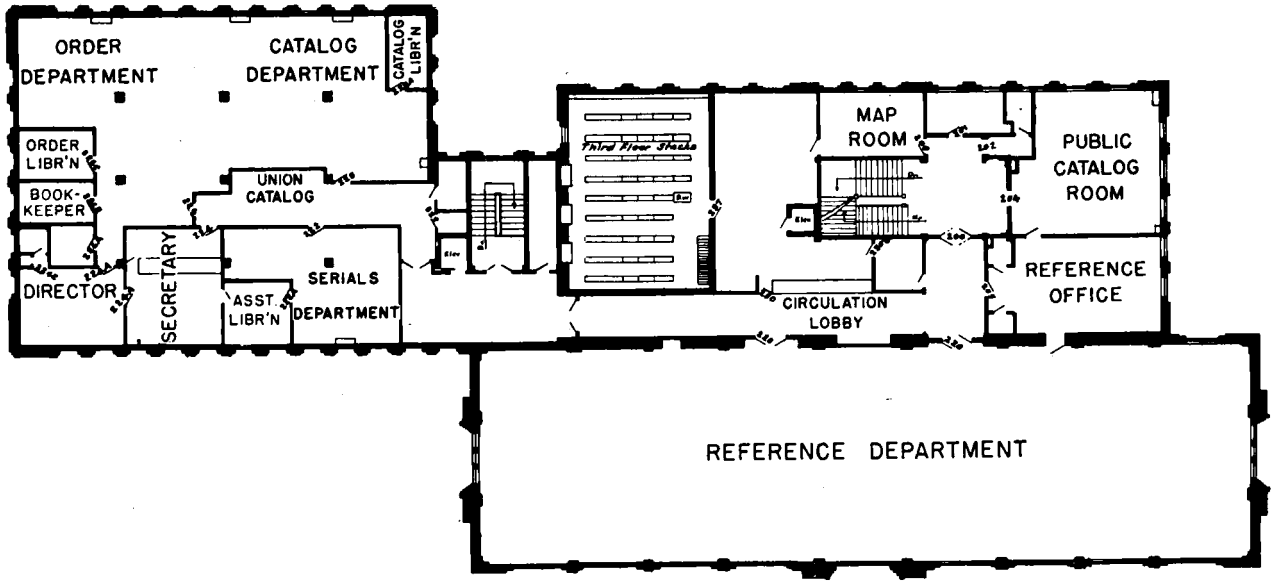

Figure 2. Second Floor Plan of Oregon State College Library.

collection, in a limited sense, is a college library in miniature. It is an integral part, however, of the main Reference Department and of the College Library as a whole, and it functions in close cooperation with the other divisions of that library. As the Engineering and Technology Reference Room is dependent upon the main Library in many ways, it cannot be too strongly emphasized that patrons must avail themselves of the facilities of the Science Reference Room, the general Reference collection (including the Map Room, which houses many maps and charts of interest to engineers and scientists), and the main Library in general as well as the Engineering Room in order to be adequately and efficiently served. For example, through the use of the public catalog, engineers can discover a considerable number of books in fields closely related to engineering that are shelved in the main stacks or in the Science Reference Room. The Reference Department maintains in the public catalog room an Information Desk that serves as a clearinghouse for all questions on the location of library materials and the use of the library in general, including the directing of patrons to the various divisions of the library. Available also is the Union Catalog of the Oregon State System of Higher Education, which lists by author all the books in the libraries of the several state institutions. On March 1, 1942, there were 606,130 volumes, all of which are available to the students and faculties of all the institutions.

V. THE ENGINEERING AND TECHNOLOGY REFERENCE ROOM BOOK COLLECTION, FACILITIES, AND SERVICES

About 18,000 books and serials are classified in engineering and technology, which is about 10 per cent of the entire Oregon State College Library collection. These 18,000 books are all shelved in the Technology Room on "open shelves"—i.e., patrons are allowed to go directly to the shelves and consult any of the books.

All circulating material is charged out to the borrowers from this room and is returned there. Magazines, bulletins, journals, reports, documents, and the like are for use in the room only. As no one may charge these out, they are always available for reference use by the patrons.

The library staff members on duty in the room assist patrons in finding material on any technical subject. One can save himself much time by asking for help in finding the material wanted. The librarian can usually point out how to attack a problem and how to carry it through with a minimum of lost energy and time. The more a person learns about these procedures, the less time is wasted in groping about for elusive material.

1. **System of classification and arrangement of books.** In most libraries, books are classified according to subjects, so that all books on a given subject will be shelved together as a group. Systems of symbols for marking books have been devised to aid in shelving books in the proper groups, and thus it is not necessary to decide in which group a book belongs every time it is returned to the shelves. This library used the Dewey decimal system of classification until it became inadequate for handling the ever-growing subject field in science and technology. Consequently, a few years ago the Library began classifying books according to the Library of Congress system, as more closely suited to its needs. The reclassification from the Dewey to the Library of

Congress system is nearing completion in the scientific and technical fields. The use of two parallel systems is a minor consideration in the Library, because the basic principles of the two are very similar.

In the Library of Congress system, "Q" stands for science—Q is general science, QA is mathematics, QC is physics, QD is chemistry, QK is botany, etc. "T" stands for technology, which is defined by Webster as, "applied science (contrasted with pure science)." The Library of Congress has had its schedules of classification printed for general distribution. The following list shows the subfields of technology:

T	Technology in General
TA	General and Civil Engineering
TC	Hydraulic Engineering, Harbors, Rivers, Canals
TD	Sanitary and Municipal Engineering
TE	Roads and Pavements
TF	Railroad Engineering and Operation
TG	Bridge and Roof Engineering
TH	Building. Fire Prevention and Extinction
TJ	Mechanical Engineering
TK	Electrical Engineering and Industries
TL	Motor Vehicles. Automotive and Aeronautical Engineering
TN	Mining Engineering. Mineral Industries
TP	Chemical Engineering and Chemical Technology
TR	Photography
TS	Manufactures of all Kinds, Including Metal, Paper, Textiles, Lumber, Leather
TT1-380	Industrial Arts, Mechanic Trades
TT390-999	Dressmaking, Millinery, Tailoring, Needlework
TX	Home Economics

Those books classified in T through TP and from TS through TT380 are shelved in that order (T, TA, TC, TD, etc.) in the Technology Room. Photography and home economics are shelved in the main Library stacks, as the first is of general interest and the second is a large collection for the use of a particular group—the School of Home Economics.

Engineering and technology in the Dewey decimal system of classification include the following class numbers: 620 through 629 and 660 through 699, which develop numerically a logical arangement of technical subjects similar to the other system.

These classification numbers serve to identify books as well as to arrange them on the shelves by subject groups.

On the left margin of every card in the library catalog appears a group of letters and numbers which is termed a "call number." By means of this number the patron may "call" for the book. These numbers represent the subject in which the book is classified, the author of the book, and perhaps the edition. No two books have exactly the same call number, therefore the book can be completely identified by the call number alone. The call number then, is a symbol of an abbreviation for the author, title, subject, and possibly the edition of the book.

Inasmuch as the Engineering and Technology Reference Room includes a reading room on the first floor and three stack rooms below it on the ground floor, it has been found advisable to shelve on the first floor the material that

will be used most. As periodicals constitute the backbone of the collection in a technical library, it was decided to give preference in location to those sets of periodicals that the library is receiving currently. Since most of the use of periodicals is confined to the more recent issues, only about the last ten years of any set are shelved on the first floor for ready access to the reading room tables. The earlier volumes of these sets are shelved in their proper places in the stacks on the ground floor.

2. **Special catalogs.** As already indicated, the Engineering Room maintains a classed catalog. In special fields such as technology, the demand for material is largely for a list of books on a certain subject; therefore a catalog in which the cards are arranged by subjects or classes, that is, a classed catalog, is especially desirable. For example, if one is interested in a book on surveying, he can check the cards on that subject to determine what books are in the collection. To find the section of the card catalog devoted to books on surveying, one may use the index to the catalog, which is arranged alphabetically by subjects. This index is in book form. As the cards in the catalog are arranged by subjects, one can not look up a particular book under the author's name nor under the title of the book but must refer to the main library card catalog for this.

In one drawer of the catalog is a list of cards of the titles of periodicals, journals, bulletins, etc., in the Engineering Room. This list is arranged alphabetically, and the section number in which the periodical is shelved is noted in pencil on the left margin of each card.

There is also another drawer of cards listing the titles of these same periodicals received currently in the Engineering Room. This list is arranged by subjects; for example, all the magazines on aviation are listed under that heading.

A collection of uncataloged pamphlets and manufacturers' announcements that describe technical processes and equipment is maintained in the room for those interested in current developments in technology. This material is arranged by subjects and kept in folders in a file. A list of subjects represented in that file is included in the card catalog.

3. **Reference works.** In a technical library it is essential to have some of the books that list concise statistical information or physical data pertaining to the field or fields of engineering and technology—such as mathematical tables, logarithms, physical constants, tables of temperature, pressure, boiling and melting points, etc. A representative collection of these handbooks is shelved in the reading room for the convenience of the student or patron. These may be taken out for home use.

There is also in the room a group of reference books. This includes a few handbooks, technical dictionaries, directories, catalogs of manufacturers' products, indexes, and bibliographies (books that list writings on a given subject). These are to be used in the reading room.

4. **Periodical indexes.** Every year several thousand magazines and periodicals are published in the United States. Many commercial institutions make a business of assimilating and indexing the enormous amount of material contained in these magazines. For example, in the technical fields are the *Engineering Index,* the *Industrial Arts Index, Chemical Abstracts,* and *Science Abstracts.* These are comparable in style to the *Readers' Guide to Periodical Literature.* The *Engineering Index* and the *Industrial Arts Index* are shelved in the Engineering Room.

The *Engineering Index* lists articles in about two thousand magazines, and is published once a year. It is arranged by subject with an author index. The *Industrial Arts Index* has the value of being published every month, so that the very latest information is made available through this compilation. Incidentally, one can save considerable effort by taking a moment to read the instructions for using these indexes, found in the first few pages of each volume.

After having discussed the facilities and organization of the technical library, we shall now consider the basic principles of using libraries effectively.

VI. GENERAL METHODS OF APPROACH IN SEARCHING LIBRARY MATERIAL

When one attempts to solve a problem in mathematics, he must first read the statement of the problem carefully enough to obtain its full import. Second, he decides into which category or type of mathematics the problem may be classified. Third, he chooses the proper approach or formula for solving the problem, and finally, he employs these methods or tools in the actual solving of the example. The method of approach used in solving mathematical problems may be applied equally well to searching for library material on a given subject.

1. **Studying the question carefully.** The professional librarian is trained to deal with bibliographic searches according to this logical method. As a librarian, the writer has found that the patron's difficulties in finding material are alleviated to a large extent when a logical approach is suggested. Half the battle is won when the question has been clearly and completely stated. Without a thorough understanding of the problem neither the librarian nor the student can proceed effectively to attempt a solution. This point is so obvious that it need not be mentioned were it not for the fact that educators are continually urging their students to read and understand the problem before proceeding with the solution. This would indicate a tendency on the part of most students to disregard this fundamental principle.

2. **Determining the subject category.** In discussing the use of a technical library it will be assumed that the patron will have already determined in which general category his question may be classified. That is, he will know that the subject is in the field of applied science or technology and in the subfield of electrical engineering, for example. He may even know in which division of the subfield the subject may occur.

Because of the broad scope of the technical literature, it is advisable to define the limits of the subject in question so as to eliminate those sources of information that are not pertinent. In classifying the subject, moreover, one must not neglect other subjects in both pure and applied science that are closely related to the primary question, as these may assist in obtaining the proper perspective.

3. **Choosing the proper tools and sources.** After one has determined exactly on what subject he wishes to obtain printed material and has found the category of technical knowledge in which this subject fits and its relation to other subjects, he is ready to choose the proper bibliographic tools and sources with which to obtain the desired information.

The first consideration should be to decide which type of material is wanted: recent information, statistical or compact factual data, or an elementary or general discussion of the subject. Recent information is best obtained from the current journals in the field, patents, bulletins, documents, or reports. Factual data come from handbooks, catalogs, or texts, as well as from the above sources. Textbooks and reports are usually the most satisfactory guides to general information, as they are digests of the progress in a field and tend to show relative importance of subjects.

The periodical indexes, especially the *Engineering Index* and the *Industrial Arts Index,* are very useful for finding the recent technical information contained in periodicals of all types. The use of these indexes may be supplemented by consulting directly the journals in the field; this brings one right up to the latest issue. The patent literature should not be neglected when searching for recent information on a subject. This topic is discussed in a later section.

It may be well to note in a discussion of technical periodicals that a given professional society may publish as many as three different types of periodical or serial publications, such as (1) a *Journal,* which, as the name implies, is a record of current developments in the field and of news items. (2) *Proceedings,* which are the minutes of meetings of the society, including the scientific and technical papers presented at their conventions. (3) *Transactions,* which include the proceedings plus comments and criticisms on the papers presented to the society in convention. The latter, therefore, are the most important publications since they include the comments of the leading men in the profession on ideas that are new and up to date.

A technical library usually maintains a collection of handbooks, catalogs, dictionaries, directories, and bibliographies for ready reference by the patrons and librarians. The librarian can point these out to the patron interested in statistics or in brief, factual data.

There are two methods of discovering what textbooks and general reference works on a given subject are in the library's collection. One is to consult the card catalog of the collection, looking under the subject heading desired. Instructions on the use of the catalog are often made available to guide the user, or assistance is offered by the librarian. Another method is to check printed lists of books on certain subjects to discover what material is available. In these lists the call numbers of those books in the library's collection are often written in pencil in the margins of the printed lists to save the patron's time in locating the book. An excellent example of a list of books on engineering is the *Selected Bibliography of Engineering Subjects,* issued in five sections in 1937 by the Engineers' Council for Professional Development. This compilation covers a wide variety of subjects in all the major fields of engineering. More and more publications appear which are devoted to a review of all material in a single field and periodically brought up to date; for example, *Annual Bibliography of Rubber Manufacture,* Ellis' *Chemistry of the Petroleum Derivates,* and "Annual Review Number" in periodicals.

When considering the type of material to consult, it is important also to ascertain whether the source of the information is primary or secondary. Primary sources are preferred by careful investigators, as these sources are authoritative and more likely to be accurate than the second- or third-hand accounts of the same information. For example, if one wished to obtain the standards for testing a certain substance or a piece of equipment, he should consult the standards issued by the American Society for Testing Materials

or the test codes and standards of the national engineering society in the field, such as the A. S. M. E. Power Test Codes. The information in these publications would tend to be much more accurate, complete, and up to date than that obtained in a textbook on engineering materials or design. Moreover, the source would be accepted by others without question.

4. **Using library facilities effectively.** Practice in using a library coupled with a general knowledge of the arrangement and workings of a library soon smooths the path for the student struggling with reports and term papers. Even those who are somewhat familiar with library procedures and book collections should realize that the library, like all other agencies of education, yields most when known best and only by frequent usage can full appreciation of the facilities be gained.

In using the facilities of a technical library the patron should keep in mind the general principles of library searching as already described. He should also know what general type of bibliographic tools will best serve: such as the *Engineering Index* for locating periodical articles, and the card catalog and bibliographies for finding textbooks on a given subject. Bibliographies or references listed in magazine articles or books should be utilized in library searches, as these lists are an efficient means for finding the significant literature as selected by an authority on the subject. This permits the investigator to reap the full benefits of another's research. It is wiser to consult the latest works first, as texts or articles often include a pertinent bibliography listing the important preceding references. This knowledge plus intelligent observation of library arrangement and procedures should enable the patron to use a technical library efficiently. The librarian is always ready and willing to assist people in locating material and to answer questions.

VII. ILLUSTRATIONS OF METHODS OF APPROACH IN THE ENGINEERING SUBJECT FIELDS

A few specific examples of typical problems in locating library material may serve to illustrate the general methods described in the preceding section. An example is taken from each of the major fields of technology so as to ensure an adequate sampling of the several types of literature.

1. **Chemical Engineering.** If one wished to read up on the subject of production of synthetic rubber, he might take the following steps in locating library material on this subject: (a) In studying the statement of the problem, he would see at once that there are several aspects to this question—for example, the chemistry of synthetic rubber production, statistics on amounts produced, history of the subject, political and military importance of the product, comparison in quality between the natural and manufactured substance, or equipment used in its production. Before starting to look for material, one should have defined as exactly as possible the scope and purpose of his investigation. Let us assume that this particular search is for preparing a general survey of synthetic rubber for a brief report to a chemistry class. Recent information is best obtained from the current journals in the field, patents, bulletins, documents, or reports. Factual data comes from handbooks, catalogs, or texts, as well as from the above sources. Textbooks and reports are usually the most satisfactory guides to general information as they are digests of the progress in a field and tend to show relative importance of subjects. (b) The subject falls in the category of applied chemistry. (c) As this is a subject of

current interest, articles in periodicals would be the best sources of information as they contain more recent information than books. To locate these articles one could find sufficient material for a brief report by consulting *Chemical Abstracts* and the *Industrial Arts Index.* (d) In looking under the heading, "Rubber, Artificial" in the *Industrial Arts Index,* 1941 volume, one finds 76 entries for articles on this subject. *Chemical Abstracts,* "key to the world's chemical literature," has a section (No. 30) on "Rubber and allied substances." Many of these references are very technical, but some would be useful in a limited study of this kind. After writing down those references that seem worth investigating, one can locate the periodicals in which these articles appear and use the material for the report. Most libraries arrange their periodicals in order by subject groups or alphabetically by titles and provide lists to indicate the location of each title. With a little help from the librarian and one or two practice searches, one can locate these materials very quickly and easily.

This is a very simple example of a search for material in the field of chemical engineering. The same methods would be used for a more complex problem—the only difference being in the difficulty of the problem itself and the number of sources to be consulted.

2. **Civil Engineering.** If one wished to make a survey for a highway between Corvallis and Albany, he would want to locate bench marks for reference points in surveying. This information can best be obtained from the publications of the government bureaus such as the Geological Survey and the Coast and Geodetic Survey. Checking the index to the Geological Survey publications under the heading: "Oregon, Leveling," one finds an entry for *Bulletin* 556, which contains the desired information on pages 107 and 108. One can also look in the main library catalog under the heading: "U. S. Coast and Geodetic Survey. Leveling in Oregon" to find *Special Publication* 177, which lists, for example, on page 171 the locations of several bench marks on the Oregon State College campus. Many of the publications of these two bureaus are shelved in the Science Reference Room.

This example is intended to illustrate the point made in the general discussion of searching library material to the effect that primary sources are preferable to any other when obtaining correct data is an essential factor in the problem.

If one is interested in the type of turbines installed at Bonneville Dam, he might consult the reports of the U. S. Office of Administration, Bonneville Project; Oregon Hydroelectric Commission; or Oregon State Planning Board. These reports can be located by looking in the main library card catalog under the heading: "Bonneville Dam." This information could be found with equal facility through the use of the *Engineering Index* under the heading: "Hydroelectric power plants—Oregon."

3. **Electrical Engineering.** Problem: Design of an electric generator as a 60 cycle alternating current power source. Category: power division of electrical engineering field. Bibliographic sources: *Engineering Index,* cumulative indexes to the *Transactions* of the American Institute of Electrical Engineers, *Electrical Engineering Abstracts,* library card catalog, catalogs of manufacturers of electrical equipment, such as General Electric or Westinghouse. Locating the material: Check the heading "Electric generators" and any others that are pertinent in the *Engineering Index* and the indexes to the *Transactions* and note the references to be investigated. If necessary, check the *Electrical Engineering Abstracts* under the proper subject classification. The subject heading "Electric machinery—Alternating current" in the main card catalog

will lead one to several books on the subject. The catalogs of manufacturers of electrical equipment may be obtained by consulting the librarian as to their arrangement and location.

Electrical engineering is a large and important field the subject content of which tends to be highly technical. Many of its subfields are closely related to mathematics and physics. These sciences should not be neglected when searching the literature. The methods of searching are in general the same as for those of other technical fields and here, as well as elsewhere, the investigator will do well to view the subject under consideration in terms of the whole field in order to appreciate its significance and its relation to allied subjects. The Library of Congress schedule of classification for Technology serves as an excellent guide to relations between subjects and the organization of the subjects within a given field of engineering.

4. **Industrial Arts, including Industrial Administration and Industrial Education.** Problem: The preparation of a bibliography on industrial administration by a student of industrial administration. Category: Industrial administration. Bibliographic sources: *Engineering Index, Industrial Arts Index,* card catalog of the library, bibliographies such as the E. C. P. D. *Selected Bibliography of Engineering Subjects, Section 3: Industrial Engineering* and *Bibliography of Industrial Administration,* a mimeographed list compiled in 1941 by the Industrial Arts Department at Oregon State College. Locating the material: From the two bibliographies mentioned the student may select those titles suitable for his own bibliography and supplement these lists with references taken from a search of the two periodical indexes and the card catalog.

The preparation of bibliographies is often an annoying task for students because they neglect to obtain the complete citation of the reference when first noting it. This necessitates searching a second time for the same information, a tiresome and wasteful procedure. Consistency and uniformity in setting down the information in each reference cited is highly desirable as this makes for exactness and clarity of the bibliography as a whole. There are many style manuals available that give instructions in the preparation of bibliographies. An excellent example of a style manual is Peyton Hurt's *Bibliography and Footnotes; a Style Manual for College and University Students,* published by the University of California Press in 1937.

5. **Mechanical Engineering.** Problem: Determining the mechanical efficiency of a Diesel engine. Category: Mechanical engineering, including these subfields: applied mechanics, automotive, and oil and gas power. Bibliographic sources: *Engineering Index,* card catalog of the library, periodicals such as *Journal of Applied Mechanics, Society of Automotive Engineers Journal, Diesel Power and Diesel Transportation, Diesel Engine Users Association* (London) *Publications.* Locating the material: Check the card catalog under the heading "Diesel engine" or "Diesel motor" to locate the basic texts on the subject. If this material is not adequate nor recent enough, check the *Engineering Index* for articles in periodicals and supplement this with an examination of some of the periodicals in this field. A handbook such as L. S. Marks' *Mechanical Engineers' Handbook* may be useful for obtaining data on the performance of Diesel engines.

It may be well to mention that every field, as well as many of the major subfields, of engineering has its professional society or organization for the promotion of study and research as well as for the professional development of its members. The publications of these societies may contain most of the significant literature in the respective fields. The complete sets of the publi-

cations of the founder societies constitute, therefore, excellent histories of the developments in their respective fields. For example, the American Society of Mechanical Engineers publishes the *Transactions* of the Society and *Mechanical Engineering*. The *Journal of Applied Mechanics* is a quarterly publication, forming part of the *Transactions*.

6. **Mining and Metallurgical Engineering.** Problem: The production of copper in the United States: methods employed and amounts produced. Category: Mining and metallurgical engineering. Bibliographic sources: Card catalog of the library, index to publications of the U. S. Bureau of Mines, *Yearbook* of the Bureau of Mines for information on quantities produced. Locating the material: The classed catalog of the Engineering Room may be checked under the heading of copper mining for a list of books on the subject. The U. S. Bureau of Mines *Technical Paper* and *Bulletin* series are excellent sources of information for material of this kind. These publications are well indexed and easily accessible. They contain considerable information of interest to other fields of engineering and technology.

Publications of government bureaus, both state and federal, are very important sources of information for technical or scientific subjects. They should not be neglected in library searches. The librarian can assist in locating the material that is not clearly indicated by title or subject, such as the P. W. A. surveys, certain reports and special publications of state and federal bureaus, and reports of commissions and ephemeral agencies.

These six examples of methods in locating library materials are intended to serve only as illustrations of the general methods to be employed in library searches. The general principles may be used by investigators in any field; the specific bibliographic tools to be consulted may be determined according to the resources of the library and the characteristics of the particular subject field being studied. The library patron should attempt to gain an appreciation for the scope of his own field as well as the relation of this field to allied subjects.

In the preceding sections we have considered the organization and facilities of a technical library, the general methods of approach in searching the literature, and a few specific problems in looking up material on engineering subjects. The next section deals with sources common to all fields of engineering, and the final section with sources of information outside the given technical library.

VIII. SOURCES COMMON TO ALL FIELDS OF ENGINEERING

1. **The general literature of engineering.** As pure science is the basis for applied science or technology, an understanding of mathematics, chemistry, and physics is fundamental to the comprehension of the principles of the application of the sciences. Since the literatures of science and technology are so closely related, it is often necessary to consult the collections of both the Science Reference Room and the Engineering and Technology Reference Room to ensure an adequate coverage of the subject.

Among the several fields of engineering there is also considerable overlapping of subject matter. For example, industrial administration is important to industrial arts, and to mechanical, chemical, and electrical engineering as well. The testing and the handling of materials along with technical processes are common to all the fields. Various aspects of hydraulics are a part of civil,

electrical, and mechanical engineering. Machine design is used by many of the branches. Library classification and facilities overlap in somewhat the same manner and for the same reasons.

Certain types of publications of general interest to engineers are the following: 1. *Biographical dictionaries* such as *Who's Who in Engineering.* 2. *Bibliographies* on the order of the *Selected Bibliography of Engineering Subjects,* prepared by the Engineers' Council for Professional Development. 3. *Directories of manufacturers and their products;* for example: *Thomas' Register of American Manufacturers.* 4. *Manufacturers' catalogs* such as those issued by General Electric, Allis-Chalmers, or Westinghouse. 5. *Technical dictionaries* of the same type as *Thorpe's Dictionary of Applied Chemistry.* 6. *Periodical indexes: Engineering Index, Industrial Arts Index.* 7. *Handbooks* (choose the latest edition!) such as Alford *Cost and Production Handbook,* Kent *Mechanical Engineers' Handbook,* Kidder and Parker *Architects' and Builders' Handbook,* Knowlton *Standard Handbook for Electrical Engineers,* Marks *Mechanical Engineers' Handbook,* Peele *Mining Engineers' Handbook,* Pender, Del Mar, and McIlwain *Electrical Engineers' Handbook,* Perry *Chemical Engineers' Handbook,* Urquhart *Civil Engineers' Handbook.* 8. The Library of Congress schedule of classification for technology serves as a guide to the organization of the subject fields. This brief list of reference works is illustrative of the type of bibliographic tools that one may expect to find in a technical library.

2. **The official patent literature.** The patent literature is important to engineers because it often contains information not available from any other source, as inventions of new equipment or processes are usually patented before they are disclosed by articles written in technical journals.

Among the official publications of the U. S. Patent Office are the Official Gazette and its annual index, *Decisions of the Commissioner,* and the *Manual of Classification of Patents.* The date of issue of any patent is the date of publication in the *Official Gazette,* a weekly periodical, published from 1872 to date.

Unfortunately there is no subject index to the patents. The annual index of the *Official Gazette* merely lists the inventions by title and the names of the patentees alphabetically. There are very few cross references to these titles. The only key to locating patents on a given subject with any degree of facility is by means of the journals that list the recent patents in a certain field or through the abstract journals such as *Chemical Abstracts.* One can keep up with the patents being issued in his own field by checking the proper subject classifications in each issue of the *Official Gazette,* but this is a formidable task. The library of the Patent Office in Washington, D. C., has facilities for searching the patent literature according to subjects. An excellent source of information on the patent literature is Byron A. Soule's *Library Guide for the Chemist.* New York, McGraw-Hill, 1938.

IX. OTHER SOURCES OF TECHNICAL INFORMATION

The advanced student, the faculty member, and the practicing engineer may at times have occasion to locate printed material in other libraries. It may be that the resources of their own library are inadequate for a certain piece of research or that they are not within a convenient distance of a technical library.

It would be useful for them to know to what library they could send for information on technical subjects or where they could expect to find a good technical library. A few suggestions for determining the scope and character of the bibliographic resources of a particular region are given here.

1. **Prominent technical libraries.** One can expect to find a good collection of technical books or even a separate technical department in many of the larger public libraries. In the Pacific Northwest the technical departments of the Portland Library Association and of the Seattle Public Library are outstanding. In California the Los Angeles Public Library has an excellent technical department as well as a separate division for official patent literature, both United States and foreign. Of the many prominent libraries in the East that have collections of technical literature, one should mention at least the New York Public Library, the Engineering Societies Library in New York, the "national library": the Library of Congress in Washington, D. C., and the John Crerar Library in Chicago. Of these the Engineering Societies Library offers most for engineers as it attempts to cover the whole field of technical science. This library maintains an excellent information service, which includes photostating and translating services for those who require this assistance.

Colleges and universities which offer engineering courses maintain technical collections either as a part of the main library, a separate division in the library, or in conjunction with the teaching departments. Three illustrations chosen from the Pacific states are Oregon State College, University of Washington, and the University of California. As these are state institutions, residents of those respective states may expect consideration of their requests for information from these libraries, in so far as this does not interfere with the needs of the college program. The Massachusetts Institute of Technology in Cambridge is one of the leading engineering schools in the country. It has an excellent collection of technical literature.

Many industrial and commercial firms throughout the country maintain libraries for the use of their research staffs. For the most part these collections consist only of current technical material. The librarians are often specialists in the technical literature and are able to select and evaluate the pertinent technical literature in current publications. Consulting and practicing engineers are often served by these libraries employed by large industrial firms. Many of these industrial or special libraries are grouped together in an organization called the Special Libraries Association. This body serves the engineering profession indirectly by the preparation of bibliographies and directories such as *The Bibliography of Electrical Engineering, Directory of Microfilm Sources,* and the *Union List of Serials of the San Francisco Bay Region.*

2. **Regional bibliographic centers.** In recent years emphasis has been placed on cooperation between libraries. One application of this has been the effort to establish cooperative agencies for pooling information on the location of library materials in a given region. For example, in Oregon under the unified system of higher education, copies of the card catalogs of the libraries of the six institutions of higher education are brought together to form a union catalog of library materials for the whole system. Through the use of this catalog, one can determine the location of any book in the system. Other examples of bibliographic centers are the Pacific Northwest Bibliographic Center maintained at the University of Washington Library in Seattle. This is being prepared under the direction of the Pacific Northwest Library Associa-

tion Committee on Bibliography. As this contains copies of the catalogs of all libraries in the Pacific Northwest, it serves as a valuable index to the library resources of this region. A similar center for the Rocky Mountain region is maintained at the University of Denver.

Finally, no discussion of bibliographic sources would be complete without mentioning the Library of Congress. The Library, the largest in the world, contains about six million printed books and pamphlets; about one and a half million maps and views; one and a quarter million volumes and pieces of music; and about six hundred thousand prints, besides millions of uncounted pieces of historical and literary manuscript material. Books are lent out on inter-library loans to libraries all over the country. The principal contribution of the Library of Congress to library cooperation is the printing and distribution of catalog cards. The use of these printed cards permits a considerable saving of time and effort for both catalogers and typists, since each book cataloged in a large library requires an average of four or five catalog cards. The use of the Library of Congress cards by so many libraries tends to standardize the bibliographical and cataloging practices of libraries in general. Uniform practices, in turn, tend to promote library cooperation in such enterprises as bibliographic centers, which are of great assistance in supplying library materials for scholars and scientists.

X. SERVICES OFFERED BY THE OREGON STATE LIBRARY TO ENGINEERS AND TECHNOLOGISTS IN OREGON

For the convenience of those interested in printed materials, a few brief statements on the services offered to the general public of Oregon by the Oregon State College Library are included in this discussion on the use of a technical library.

1. **Use of the Library by the general public.** The Library, as part of a state institution, stands ready at all times to serve the citizens of the state, insofar as this does not interfere with the Library's primary function of serving the needs of the educational program of Oregon State College. Anyone may make use of the Library's reference works, card catalogs, or that part of the book collection not in immediate demand by the College staff or students. Books are loaned out for home use, however, only to members of the College staff or student body.

2. **Library hours.** The Library is open for service the year around. During the regular school year the Library is open from 7:45 a.m. to 10:00 p.m. Monday through Saturday. For the main summer sessions the hours are from 8:00 a.m. to 9:30 p.m. Monday through Thursday and 8:00 a.m. to 6:00 p.m. on Friday and Saturday. Between sessions the hours are 8:00 a.m. to 6:00 p.m. The Library is closed on Sundays and legal holidays.

3. **Inter-Library loans.** Books not in immediate demand by the College staff or students are loaned out for short periods of time to other libraries upon request. If a patron wished to use a book which is not in his local library, he may ask the librarian to send a request for an inter-library loan of this book to some library which is likely to have that type of material. The local library then assumes the responsibility for the return of the book to the issuing library. Engineers and technologists in the state who may not find

certain technical material available locally may apply through their local library for this material on inter-library loans from the Oregon State College Library.

4. **Preparation of bibliographies by the Library staff.** The Library prepares many working bibliographies on various subjects when the needs arise. Bibliographies can be prepared for the general public only when this does not interfere with the library service to the College and as the time of the Library reference staff permits.

5. **Facilities for documentary reproduction.** When requests come to the Library for materials that cannot be loaned out or for materials the patron wishes to use indefinitely, arrangements may be made by the Library to have the material copied, if this proves feasible. The patron assumes responsibility for any infringements of copyrights resulting from the reproduction of copyrighted material. Any material copied is furnished to the patron at cost.

XI. SUMMARY

This brief discussion on the use of a technical library is intended as a guide for those interested in the literature of engineering and technology. The manual is written especially for the patrons of the Engineering and Technology Reference Room of the Oregon State College Library, although the information may be applied equally well to the use of other collections of the same type.

The proper use of a technical library presupposes a knowledge of its facilities, familiarity with library research procedures, and an appreciation of the scope and character of the literature in each subject field. The organization and services of the Engineering Room as a part of the College Library are employed to illustrate the principles of library use. General methods of approach in searching library materials are proposed and specific examples from the several fields of engineering are used to elucidate these points.

Sources common to all fields of engineering, including the types of publications of general interest to engineers and the official patent literature are discussed briefly. Other sources of bibliographic information are mentioned and a few examples of prominent technical libraries and regional bibliographic centers are selected as illustrations of the country's library facilities. Services offered by the Oregon State College Library to engineers and technologists in Oregon are also mentioned.

The library, like all other agencies of education, yields most when known best, and only by frequent usage can full appreciation of the facilities and services be gained.

The salient role, therefore, of the technical library in research is to prevent duplication of effort and to avoid waste of time, money, and energy on the part of those engaged in original investigations in technology.

OREGON STATE COLLEGE
ENGINEERING EXPERIMENT STATION
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LIST OF PUBLICATIONS

Bulletins—

No. 1. Preliminary Report on the Control of Stream Pollution in Oregon, by C. V. Langton and H. S. Rogers. 1929.
Fifteen cents.

No. 2. A Sanitary Survey of the Willamette Valley, by H. S. Rogers, C. A. Mockmore, and C. D. Adams. 1930.
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No. 6. The Use of a Technical Library, by W. E. Jorgensen. 1942.
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